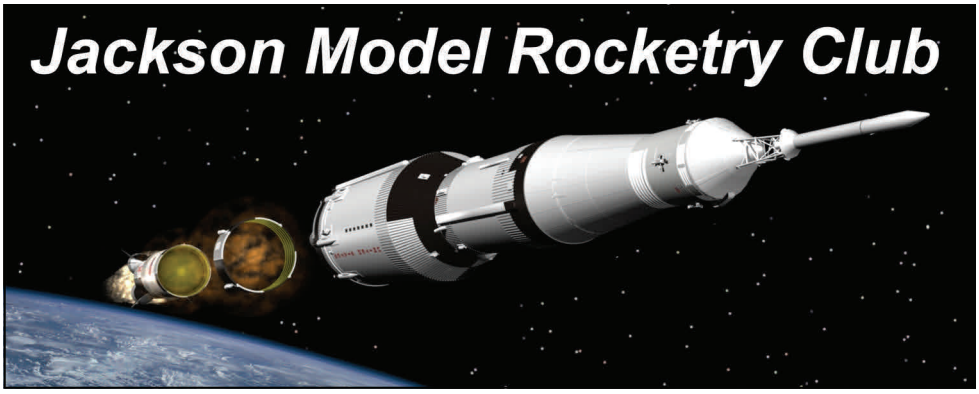

TOTAL IMPULSE

TOTAL IMPULSE VOLUME 17, NO. 4

November 2017

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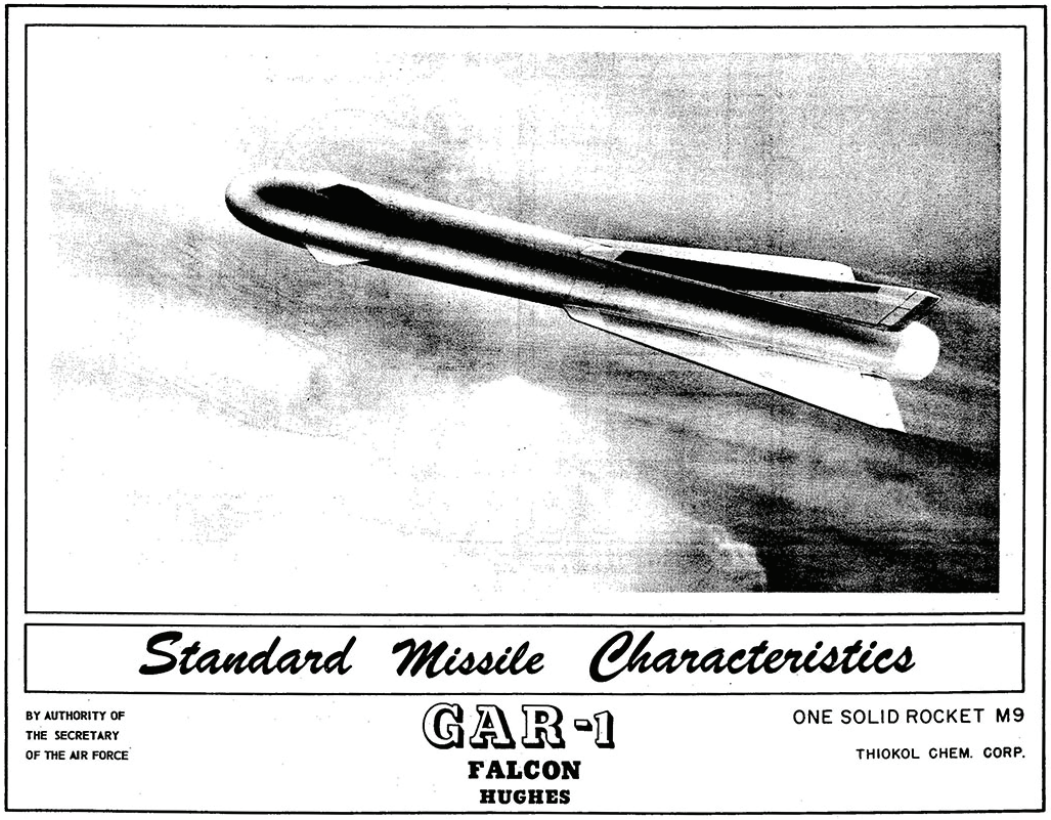
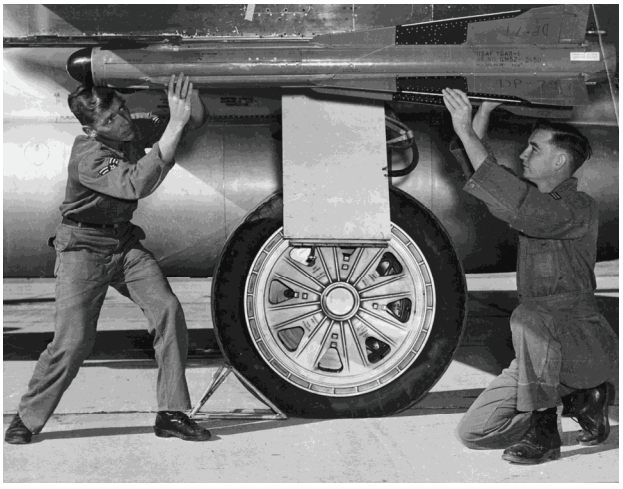
Launch/Event Calendar

- December 2 Maintenance Day!
- TBD—Holiday Party
- May 16-20 2018 LDRS 37 (Tripoli Central California)
- May 26-28, 2018 NSL 2018 (Geneseo, NY)
- August 4-10 2018 NARAM 60 (Pueblo, CO)

NOTE: Launch dates are subject to change without notice. Be sure to call the "launch hotline" at 517.262.0510 for the latest weather and field information or sign up for the JMRC Notification GroupMe chat.

Hughes GAR-1 Falcon





CLUB OFFICERS

President: Scott Miller

Vice President: Roger Sadowsky

Treasurer: Tony Haga

NAR Advisor: Buzz Nau

Secretary: Rob Dickinson

Communications: Dan Harrison

Board of Director: Dale Hodgson

Board of Director: Bob Dickinson

MEMBERSHIP

To become a member of the Jackson Model Rocketry Club means becoming a part of our family. We have monthly launches and participate in many educational events. We encourage our members to actively participate in our club projects, running for office in our annual elections, contributing to our monthly newsletter with articles or tips, and offering services to the club in their area of expertise. We have many members comprised of children, men, women, professionals, lay people, educators and people from many other walks of life.

You may fill out an application at a launch or request an application from one of our board members at scott@sfsmindustries.com and mail it along with a check for the annual membership dues (17 and under $10.00 or 18 and over $30.00) to our mailing address of: 4788 Moon Lake Rd., Jackson, MI 49201.

Members enjoy reduced launch fees (for engine sizes "F" and higher), participating in club projects, and meeting an incredible group of positive people.

COMM CHANNELS

There are several ways to keep in touch with the JMRC and it's members.

Website: http://www.jmrconline.org. Information includes directions to launch sites & schedule, range procedures, and instructions on how to join the club.

Yahoo Group: The JMRC Yahoo group is a place to share files and also serves as our primary e-mail list serv. Follow this link to join, http://groups.yahoo.com/group/jacksonmodelrocketryclub

Facebook: If you have a FaceBook account search for "Jackson Model Rocket Club JMRC" and request to be added.

GroupMe: Our new chat channel for broadcasting notifications instantly using a free download client for IOS and Droid as well as by SMS text messaging. You can join the notification chat after creating a free account and following this link, https://groupme.com/join_group/28013422/zc5IC1

FROM THE EDITORS'S RANGE BOX

NEWSLETTER NAME IS UNVEILED!

Welcome to the November issue of the JMRC News. I'd like to thank everyone that took the time to email in their picks for naming the newsletter. The winner, but an overwhelming margin, **Total Impulse** by Dale Hodgson.

Below is a list of articles and other materials that we are looking to publish. It doesn't matter how big or small your submission is. We have a great, diverse interest in our membership base. We cover every aspect of model rocketry, so take those photos, write that kit review, send in a report on what you're working on lately… share your build stories, send in a rocksim plan.

Request for articles,

- Product Reviews
- Build Reports
- Event Reports
- Technical or "How-to" articles
- Photos!
- Space History
- Scale Data
- Sport Plans
- Competition Plans / Techniques
- Support Equipment
- Model Rocket History
- Certification News
- Vendor News
- Tips n Tricks

About Total Impulse

Total Impulse is the official newsletter of the Jackson Model Rocket Club (JMRC), Tripoli Prefecture 96, NAR Section 620. Published Monthly, *Total Impulse* is a space-modeling newsletter devoted to representing the diversity of interests in today's hobby of model rocketry.

This newsletter is in the public domain except where otherwise marked. Unmarked articles, photographs, and drawings may be re-printed elsewhere, but credit to the author and this newsletter is expected. Material marked as copyrighted may not be re-printed without the consent of the author.

The editor of *Total Impulse* accepts material for inclusion from anyone.

Send correspondence to:

Jackson Model Rocket Club

Buzz Nau, Editor

5170 Reno Rd

Manchester, MI 48158

Deadline for submissions to the editor is the 15th of the month. Material received after the 15 will be published in the next month's newsletter. You can also submit your material or inquiries to the editor at ussmidway@gmail.com.

THE PRSIDENT'S CORNER

A rocket club is a group of two or more people that share an interest in rockets. We as a club can share stories and different interests in rockets regardless of the weather, location, or anything else. The next best thing about rockets is flying and/or watching them fly! The worst feeling is seeing a large group of people gather to shoot the breeze and fly some rockets only to realize we have issues with the equipment preventing anyone from flying. I would like to think we have a very impressive record for launch equipment; especially considering the massive volume of rockets we fly and the toll it takes. In order to keep our success rate as high as possible we need to perform routine maintenance on the equipment.

All of this equipment that we have collected and developed over the years has turned into a great collection, but it is a **LARGE** collection and we need as much help in maintaining it as possible. On December 2nd we are holding a maintenance day at Roger's house in Jackson and anyone that can make it is highly encouraged to do so! We normally get a decent turnout but in an effort to grow our numbers to show up we are going to offer some bribes :-). If you can make it, the club will provide lunch to anyone that shows up and lends a hand. We will also offer door prizes that include Gift Certificates, kits, etc. and this is available to anyone that shows up. Young rocketeers are welcome too, we encourage rocket folks of all ages to get their hands dirty and get a more intimate experience with all of our club equipment. This is your club and we want everyone to feel at home with us, and seeing the nuts and bolts inside a heated garage with a bunch of rocket folks surrounding you is not a bad way to spend a Saturday!

If you can make it to Roger's house on December 2nd to chat about rockets and keep our equipment in top notch shape please let us know through email to the yahoo list so we can get a rough count for food requirements. If you aren't sure or won't know until last minute, no problem just come on over anyways

Roger's address is;
4788 Moon Lake Rd
Jackson, MI 49201

CORRECTIONS DEPARTMENT

The Terrier 551 NOTS article in the October 2017 issue contained a dimension mistake. The booster fin span should have been 22 inches. The mistake has been fixed and the online version is now correct.

On the Cover:

(top) GAR-1 Falcon missile characteristics front page—courtesy of Chris Timm

(bottom) left—GAR-1 missiles in storage isopods right—Two ordnancemen load a GAR-1 on a F-89 Scorpion wing pylon. USAF photos courtesy of Chris Timm

HUGHES GAR-1 FALCON

Scale Data

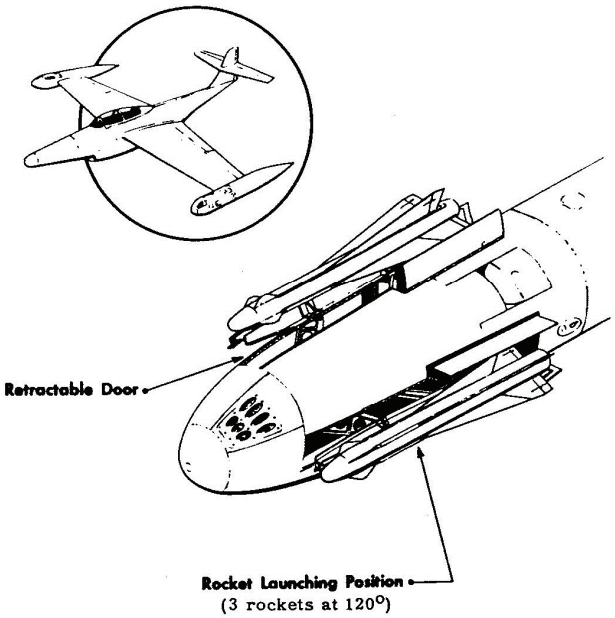
CHRIS TIMM -DRAWINGS AND PHOTOS
BUZZ NAU—TEXT

Designed and produced by the Hughes Aircraft Company, the GAR-1 Falcon was the first production USAF guided air-to-air missile. It became operational in 1956 and was carried aboard many USAF fighters including the F-89 Scorpion, F-101 Voodoo, and F-102 Delta Dagger.

The GAR-1 was the result of Hughes' original response to a 1946 USAAF research study contract, called Dragonfly, to develop an AAM (air-to-air missile). The Hughes contract for Dragonfly was called MX-798 and in early 1947 it was reoriented to concentrate on a bomber launched AAM. The refocused contract was changed to MX-904 and the project's missile was designated as AAM-A-2. This was a very volatile time for military weapons development and MX-904 was soon delegated to just developing guidance technology. By 1948 it was once again tasked with missile development under the GAR (Guided Aircraft Rocket) program.

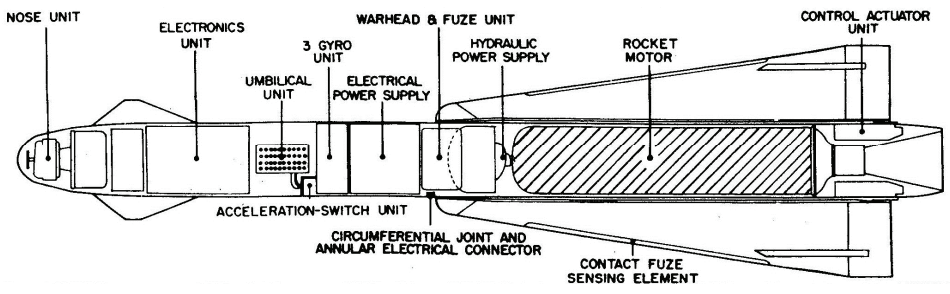
Initial ground launches of the GAR-1 occurred in 1948 and by 1949 the recently formed USAF did away with the bomber launched requirement. The original missile followed the same planform as many missiles in development at the time with mid body wings and tail fins. By 1951 the design migrated to the planform that is most recognizable as the Falcon with the dorsal delta fins and attached trailing maneuvering fins.

F-89H WING POD INSTALLATION



The GAR-1 was a diminutive 134 -pound missile at 78 inches long, 6.4 inches in diameter and a fin span of 20 inches. It was designed to be loaded on Interceptors internally with the F-89 Scorpion as the initial deployment aircraft. Guidance was via SARH (Semi-Active Radar Homing). The GAR-1 had four evenly spaced small antenna fins near the missile's nose for receiving the reflected radar signal from the firing aircraft. It did not utilize a proximity fuse like the Sparrow or Sidewinder and its warhead weighed less than 3 pounds requiring a direct hit to destroy or damage a target. Designed for use in an interceptor role, it was to be used against relatively slow bomber formations. The direct impact fuse and small warhead would severely impair its capability against small maneuvering fighters.

Air launches began in 1951 with B-25 Mitchell bombers being used often for launch platforms. By 1954 launches from F-89 Scorpions were hitting targets with a 70% success rate. The F-89 carried the missiles internally in large wingtip pods. While production missiles were being delivered in 1954, it took two more years to work out bugs with the F-89's pod launchers. The missile became IOC (initial operational capability) in 1956 as the first USAF radar guided AAM.



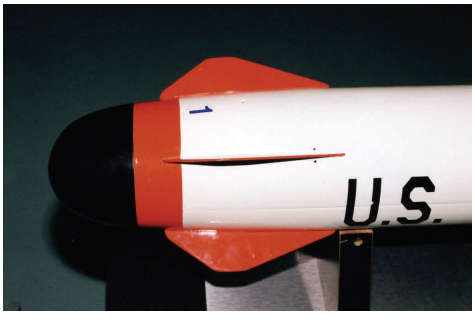
Production of the GAR-1 did not last long and this version of the Falcon was removed from service by 1960. Falcon improvements began with the GAR-1D, however, the improvement was marginal at best. Though the operating envelope was increased, the missile had an awful success rate. The GAR-1D also contained a major planform change with the delta fins being located further forward from the control fins. Performance became so bad that in 1956 the USAF pulled the GAR-1 from operation until deficiencies were

addressed. In 1957 production resumed and GAR-1D performance in Operation FASTDRAW confirmed the missile was performing satisfactory.

Development of an infrared guided Falcon began in 1952 and was designated the GAR-2. This version was fraught with multiple issues the most bothersome was the IR seeker was useless at low altitudes. It was gradually improved through a series of upgrades yet it never achieved the success rate of the US Navy's AIM-9 Sidewinder.

When the DoD rolled out the tri-service standard designation system for the US

Military in 1962 the GAR-1D was redesignated AIM-4. Unfortunately, new designation did not improve the Falcon's performance. The IR Falcon, AIM-4D, had replaced the AIM-9 on many USAF F-4 Phantom II's. The missile's deficiencies became operational detriments as F-4 squadrons deployed to SE Asia and saw combat in Vietnam. The IR seeker required 20 seconds to cool down for tracking targets and the cool down was a one-shot use that only lasted about 2 minutes. If not launched, the missile would be "dead on the rail" and need to be recharged before it could attempt another track. Only five air-to-air victories during the Vietnam conflict are attributed to the AIM-4.



The IR Falcon was so unpopular that Col. Robin Olds, commander of the 8th TFW (Tactical Fighter Wing) had maintenance crews run wiring so they could operate with AIM-9 Sidewinders. Though the field mod was unauthorized, it proved successful and the USAF ordered it for remaining F-4D's.

The radar guided GAR-3 Super Falcon was developed in the mid 50's to pair up with the F-106 Delta Dart's MA-1 fire control system. Again, performance was abysmal with a 50/50 chance of intercepting drones. A proximity fuse and slightly larger warhead did not translate to better intercepts. Real improvements finally came with the GAR-3A that included an improved motor and guidance tweaks. The GAR-4 and 4A were IR guided Super Falcons. The Super Falcons remained in service as long as the F-106 and all were retired in 1986.

Finally, there was the nuclear armed GAR-11 carried by the F-102 Delta Dagger until the W-54, 1.2kiloton warhead was retired from service. The actual purpose of the warhead was not to necessarily down incoming bombers, but to render their nuclear payloads useless from the neutron bombardment of the W-54 detonation.

Despite its poor reputation, the Falcon actually performed slightly better than the AIM-7 Sparrow in Vietnam, though both were outperformed by the twice as effective, AIM-9. However, it should be noted again that the Falcon was designed for intercepting large, slow maneuvering bombers and not smaller, faster, more nimble fighters. Also in its defense, a percentage of misses can certainly be attributed to poor training leading to engagement outside the optimum firing envelopes. Still, in an environment where success can be measured in milliseconds, it took 20 seconds for the missile (IR version) to lock on a target and be launched. Once cooled you were committed to firing it in less than two minutes or turn the Falcon into a useless inert round. Those constraints would be an unheard-of handicap in today's air-to-air warfare and explain a degree of the dissatisfaction with the missile.

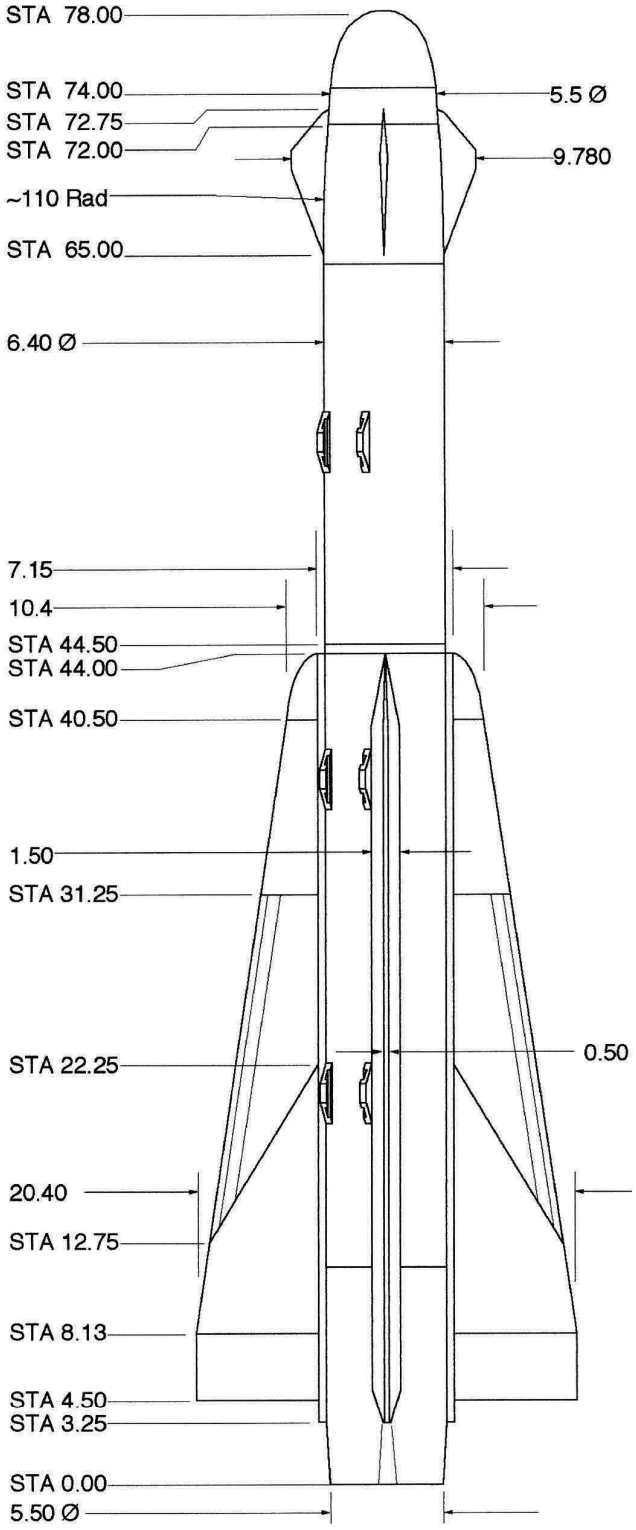
References:

"A Pioneering Air-to-air Missile: The Hughes AIM-4 Falcon", Chris Chant, 2013

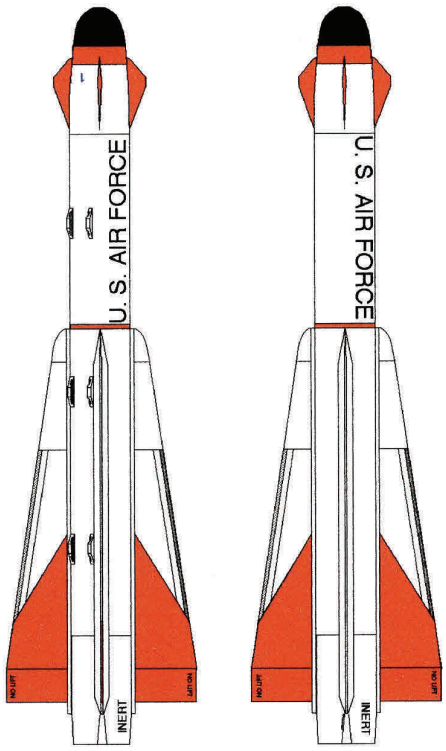
"Arming America's Interceptors: The Hughes Falcon Missile Family", Sean O'Conner, 2011

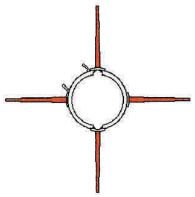
An Illustrated Guide to Modern Airborne Missiles, Bill Gunston, New York: Prentice Hall, 1983

Air Force Missileers: Victors in the Cold War, Association of the Air Force Missileers, Turner Publishing, 1998



Views 180° apart





Silver
Blue
Red-Orange
Black
White

Falcon GAR-1A

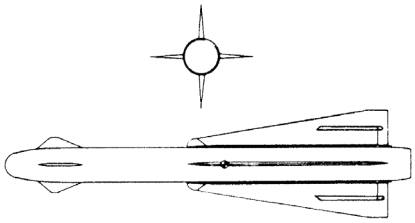
1/10 scale
Dimensions in Inches
© 2013 Chris Timm

Sources:

Measurements and photographs of missile on display at Eglin Armament Museum, Florida

Characteristics Summary

GUIDED AIRCRAFT ROCKET GAR-1



"FALCON" HUGHES

Wing Area . . . . . Not Applicable
Length . . . . . 77.8 in.
Span . . . . . 20.0 in.
Height . . . . . 20.0 in.

AVAILABILITY			PROCUREMENT			
Number available			Number to be delivered in fiscal years			
ACTIVE	RESERVE	TOTAL				

STATUS

1. Project Initiated: Mar 47
2. Complete Guided Aircraft Rocket Project Initiated: Mar 48
3. First Air-to-Air Hit: Jun 52
4. First Falcon-Equipped Squadrons: Early 56
5. Production Completed: Nov 56
6. Out of Inventory: Late 59
7. Replaced by GAR-1D

Navy Equivalent: None
Mfr's Model: D

POWER PLANT

(1) Single-phase Boost, Solid Rocket M9

Thiokol Chemical Corp.

THRUST RATINGS

S.L.S.	LB		SEC
Max:	4900	-	1.26
Nominal	4420	-	1.38

FEATURES

Supersonic Guided Aircraft Rocket for destruction of subsonic and supersonic bombers.

Blast Type Warhead

Max Fuel Cap: . . . . . 31 lb

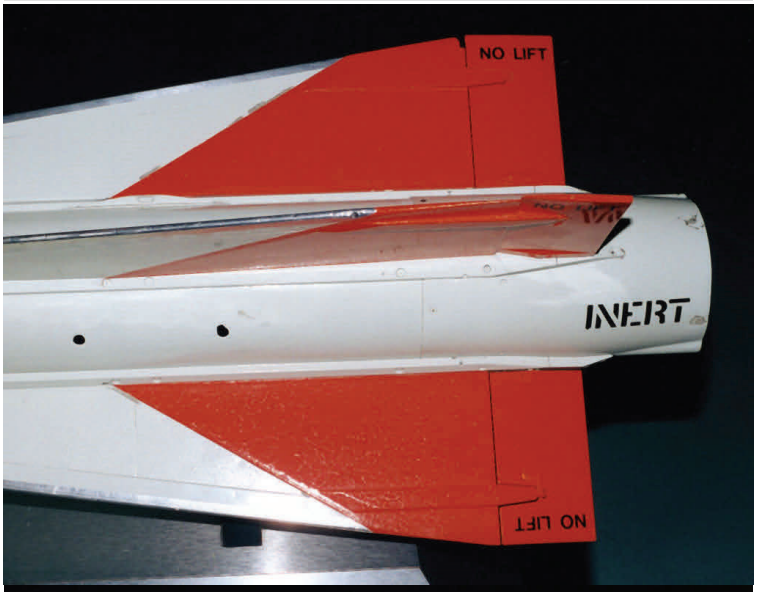
GUIDANCE

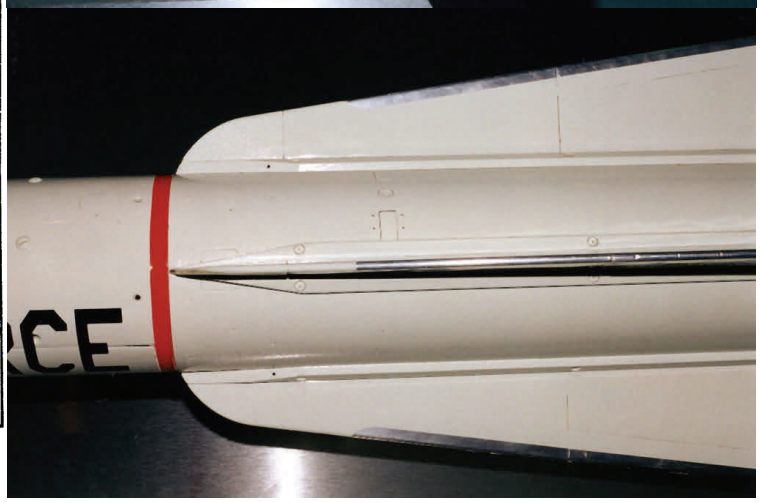
(a) INITIAL
None during boost phase

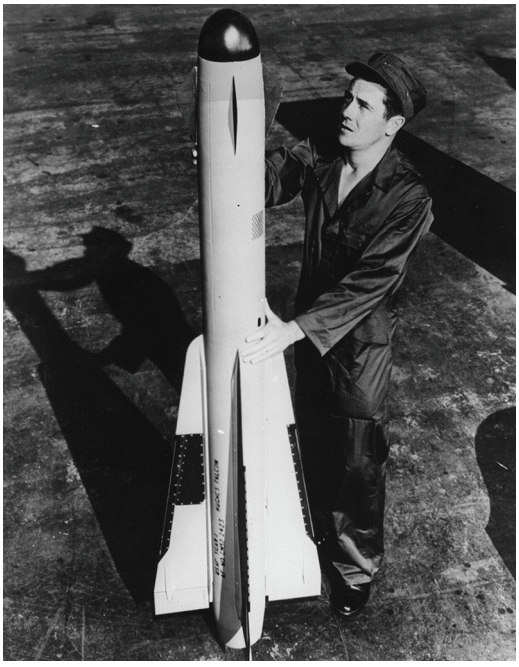
(b) MID-COURSE & TERMINAL
Semi-Active X-Band Pulse Radar, Proportional Navigation.

CONTROL

Hydraulic: Initiated by the Error Signal from Target Seeker







USAF photos—Courtesy of Chris Timm

Hindsight is Always 20/20 Part 2

View From The Flight Line

Dale Hodgson

Last time around I talked a little bit about old school stuff when it came to where we all started… low power rocketry. Much of the stuff we learned way back when holds over to what we do now, no matter the motor size. Same thing, believe it or not, holds true for motor retention, what was done back in the day can come in handy now. So, let's take a little look back and how it applies now.

Early motor retention was simply jamming an Estes motor wrapped with masking tape into a motor tube and usually up against a previously installed forward thrust ring. It worked well then and still does. Then came engine hooks, a combination of a forward thrust ring stop and rear retention to keep the motor from popping at ejection. Again, good science, good engineering.

With the development of high power rocketry, a different problem arose. Different motor lengths with the same diameter. That forward thrust ring in the motor tube had to go unless you were willing to fly the same motor over and over again. Most motor cases have a flange, or ring at the rear of the motor which prevented the motor from moving forward independent of the rocket. What was going to prevent the motor from popping at ejection? Friction fitting can work but is a little dicey given the stronger ejection charge and increased weight of the motor case. This of course does not include dual deploy which fires a separate ejection charge.

Early HPR motor retention was sometimes as simple as a wood screw and washer bored into the rear centering ring if there was

room. It was effective but temporary. Wood screws strip out eventually. Then came T nuts, screws, window screen (Kaplow) clips. These were much more sophisticated and very effective. I started out using those and a couple of my birds still have them.

Now, we have the biggies and variants of the two, Aeropack, Slimline and everything in between. External threads, internal threads, snap rings, machined aluminum; very sleek, very secure and extraordinarily strong. The epitome of what motor retention should be. No lost cases unless the rocket went with it. What downside could there be?

Unfortunately, I found one. What happens when you trash a motor retainer that was permanently installed on a rocket? Well, I found out just this past summer and came up with a fix.

At our joint launch with MMAR (affectionately known as the Crap Shoot because of the Big Icky) I flew, or tried to fly, a heavily modified LOC I-ROC on a K motor. Big rocket, big flight… almost. At launch, the motor let go from the rear and spit out the grains. There was enough "oomph" to get the rocket to the top of the rail and actually off of it… by like a ½ inch.

The rocket balanced majestically on top of the rail and toppled over, sticking the landing. Other than a heavily bruised ego, the rocket itself was fine, except for the retainer. That hang-up on the rail bent the retainer out of round and literally collapsed the snap ring seat making the retainer useless. This could have been a disaster with no way to fix the retainer or to remove it, or was there? I kind of had an epiphany. What about going old school? Off to the hardware I went to get parts. Bought a couple of stainless steel clamps, threaded brass inserts, stainless steel machine screws and a couple of steel spacers.

First, I had to do a little bending, pounding, and grinding to get the retainer back round so it would accept a motor. Fortunately, this wasn't too hard. Although the ring seat was

pretty much toast the inner part of the retainer was completely fine and held the motor just fine. After that, things went really quick and easy. I drilled a couple of holes for the bass inserts and used JB Kwik to seat them. After that I simply constructed an old-school retainer. Voila, back in business! A good marriage between old and new school. The rocket definitely hasn't seen her last flight and trust me, I have a few motors I would like to run through it. Happy flying!

Dale

Working at THOY (Tiffany Hobbies of Ypsilanti)

Model Rocketry History

Buzz Nau

THOY (Tiffany Hobbies of Ypsilanti) was a mid to high power rocketry company founded by Richard Rau in 1987. Rich produced kits, parts and supplied other rocket materials until 1995 when he sold the company to Rocket R&D. This is my little story of when I worked for Rich and what it was like to work in a rocket "factory".

Back in 1992 to 1993 I worked for a small computer hardware company called MemoryBank. They're not important, in fact, they're no longer around, but for about 8 months they cut my employment to half time. Needing something else to do while I continued applying for openings at U of M, Rich asked me if I would be interested in helping him out part time at THOY. The supplemental income was helpful and other perks included all the free damaged parts I wanted. I think all of us wish we could have an opportunity to make rockets for a living, so I said sure.

THOY was located on the old site of the Willow Run Air Force Station. The station operated from 1952 to 1959. It served as the headquarters for the 30th Air Division as well as a manual air tracking station for the Air Defense Command. In 1959 the station was sold to the University of Michigan.

Also at Willow Run was the University of Michigan's, Michigan Aeronautical Research Center. U of M bought Willow Run airport in 1947 for $1. The research center had one of the first supersonic wind tunnels and also, as part of Project Wizard, developed the guidance system for the Boeing BOMARC surface to air missile. The partnership is where the missile derived it's name. The University sold Willow Run in 1977 to Wayne County, but leases the grounds of the Willow Run Air Force Station.

The station seems just as it must have in the 1950's. The barracks, administration building, and other buildings including a base movie theater, look like a snapshot in time. The entrance has a large main gate that was padlocked. Then there was a several hundred-yard drive to the station. Trees lined the entrance drive on both sides. The station itself is set in a wooded area on the east side of Willow Run. It was peaceful and yet eerie at the same time. With the exception of the grounds keeper that lived on base, there were rarely any other people around. Imagine being on a military base that is apparently empty. Being alone there at night was downright spooky!

THOY was housed in the end of one of the barracks facing the base theater. The base theater was in use by U of M for FCC regulatory testing. Other sections of the barracks were in use by other U of M departments mainly for storage. In one particular barracks room Michigan Radio stored a lot obsolescent equipment as well as LPs of old U of M football game broadcasts.

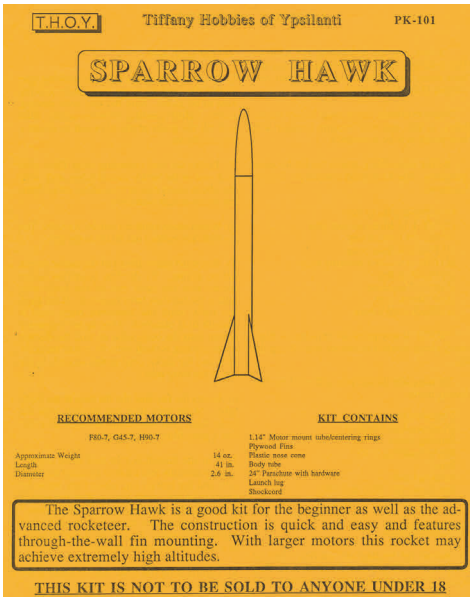
I'd work at MemoryBank in Ann Arbor from 9:00 to 1:00 and then drive out to the old base and work alone until Rich, his wife Jackie, and their two daughters arrived around 7:00. Rich, Jackie, and I would work together until around 10:00 and call it quits.

The main work room was a rocketeer's dream. Dozens of big boxes of rocket parts. A bandsaw for cutting fins, a lathe for custom parts, a drill press for cutting centering rings, and a big sewing table for making nylon chutes.

There was also a kit bagging area. Jackie did all the bagging and shipping. She also gathered all the small parts and bagged up subassemblies like engine mounts, recovery kits, bulkhead kits, etc. Rich would put together the list of orders and what parts were needed each night. Rich and I would usually cut fins, tubes, or make chutes. All THOY kits had three fins, so to cut fins we would tape three big sheets of aircraft ply together, trace out all the fins we needed in rows. Then we'd use the band saw to cut out each row and then cut out individual fin sets. A belt sander was used to clean up the edges.

The drill press was also used for cutting custom body tube lengths. We had long body tube couplers mounted to dowels with centering rings. We would chuck the adapter in the drill press and off-set the drill press table so it was near the side of the coupler. We would put a #11 xacto blade in a vise and set it on the table so the blade was parallel to the table. Then you would slip a tube over the coupler and line up where you want to cut it with the #11 blade. After turning on the drill press you would lightly rotate the blade against the tube and you had a precision cut in no time.

Chutes were a lot of fun to make. We had semi-circle patterns that we laid over folded ripstop nylon. After cutting the shape out with scissors we'd serge the edges. This takes a bit of practice to get good at it, but it greatly improves the look and durability of the chute. Then we'd fold it in half a couple of times to make creases for shroud line



THOY Falcon

location and sew them on. Rich was very exacting about his chutes and he had the finest in production kits at the time. He was also very demanding about the quality of fins and centering rings. Any chips and they went in the scrap pile.

The one part I disliked making the most was centering rings. They were made with flycutters and their blades had to be sharpened a lot. A dull blade would easily splinter the plywood and all the time you spent on the centering ring was wasted. Sharpening was time consuming as you sometimes had to sharpen them several times a session.

In the first year of operation THOY sold two 4" diameter kits with prefabricated, interchangeable motor mounts. I never got to see a Snowbird or Raven, but I've heard they were really nice kits. I can only imagine building all those motor mounts was cost prohibitive to continue them and they only lasted a year. Rich also pioneered the stainless steel leader shock lines mounted to the upper centering ring. These were really stout and held up better than gluing wide elastic shock cords to the inside of the body tube.

THOY had several iconic rockets that are still talked about today. Probably the most memorable was the 4" diameter Knighthawk. Similar to the Falcon, but with a cluster of up to seven 29mm motors. The Falcon was also extremely popular with a 54mm motor mount. Another favorite kit was the 4" diameter AIM-54 Phoenix. I believe it was the only high power scale model of a Phoenix at the time and THOY sold a lot of them. It was also the only THOY HPR kit to come with decals.

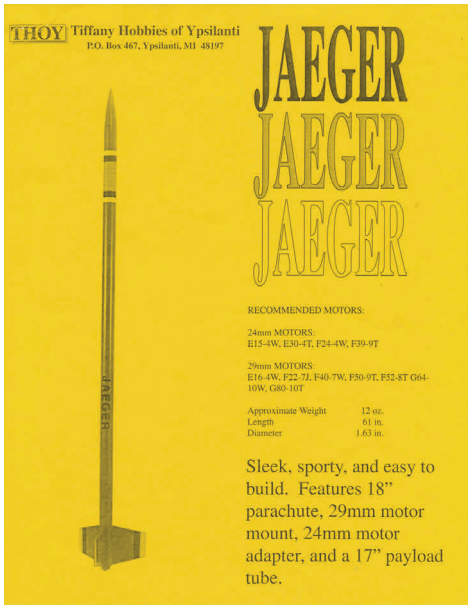
There was a line of 2.56" diameter rockets like the Snipe, Condor, Ibis, Sparrowhawk, Wren, and Accentor. Rich also had several 1.5" diameter kits including the Wasp, Robin, and Jaeger.

In the Spring of 1993 Rich asked if I could design a few 18mm motor sport rockets based on 1" diameter tubing to expand the THOY line into low power. I came up with several that we built prototypes of and test flew a lot. After writing the plans we received parts to kit out four of them. Two were basic beginner type designs called the Imp and Macron and the others were two stage models called Thuria and Cluros. We even made decals on his Mac in the shop that we got printed for the kits.

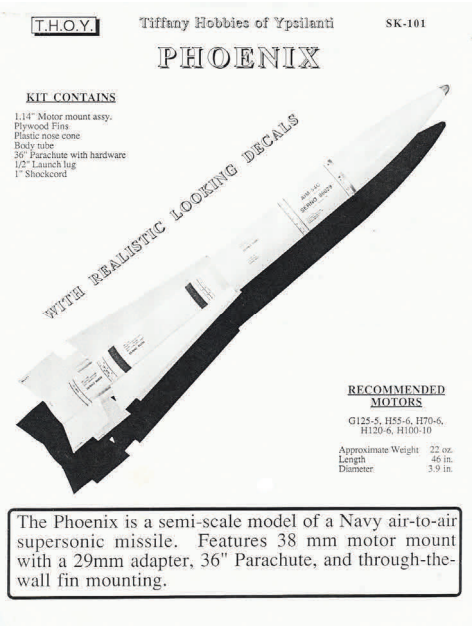
There were several other designs that would have been produced based on the success the first four. They included a scale Nike Smoke, a futuristic design, and a rear engine boost glider. Rich attended the following Chicago Model and Hobby Show, but by this time, I had gained employment at U of M and had to say good bye. If memory serves me right, Rich received a lot of positive attention at the show. However, shortly after the show Rich sold THOY's mid and high power line to

Rocket R&D in 1995. The low power kits and parts were sold to Bob Jablonski of Starlight Rocketry. I talked to Bob some years afterwards and asked if he was ever going to re-release the kits. His original plan was to do that, but the rebranding became too much, so he used the parts to create his own kit designs.

Many THOY kit plans are available on-line at the Ye Olde Rocket Plans website, http://www.oldrocketplans.com/thoy.htm. I also have one of the unreleased kit designs available on my website at http://www-personal.umich.edu/~buzznau/pdf/tavia.pdf.



We had a lot of fun working together and I will always look back fondly at the time I spent with THOY. Rich and Jackie were great to be around and very generous. There are a lot of terrific mid and high power kits out there now, but THOY kits will always be special for me.



Competition—The Basics

Competition Corner

Buzz Nau

In the last three issues, I explained the new NAR Sporting Code for competition and how it differed from the previous version called the “Pink Book”. This basic introduction to competition rocketry is the first in a series of articles for those who are thinking about trying it out or the novice who is looking for information towards improvement and consistancy.

Before we get into basic strategies there are several documents you should be familiar with. They are,

NAR United States Model Rocket Sporting Code (the rule book)
http://www.nar.org/wp-content/uploads/2017/06/USMRSC-July_-2017.pdf

NAR/CAR/TRA Combined Certified Motor List
http://www.nar.org/SandT/pdf/CombinedMotorsByImpulse.pdf

NAR Certified Altimeter List
http://www.nar.org/pinkbook/G_altimeters.html

That's really all you need to get started. The rule book, the list of motors you can use, and altimeters (for altitude events). That's it..... it finally is that simple. Prior to the new rule book it wasn’t so simple. There were contest and weight factors. You were only allowed so many of these and so many of those and it all had to add up to this. All that is gone and in its place, is a very simple contest structure that makes sanctioning and hosting a contest much easier as well as competing in the events.

There are a few, basic categories of competition events, duration, altitude, craftsman, and what I like to call filler. As the names imply, duration measures the time your flights are aloft. Altitude measures the distance in height of your flight, craftsman is mainly a test of building and finishing skills. Filler events were used in the past to “pad” the weight factors of a contest to get the full amount of points available for a contest. With the advent of the NRC series we will likely see these only at NARAM going forward, though JMRC has flown some of them in our fun contests such as spot landing.

In duration and altitude events your biggest performance killer is weight. Every design has an optimum weight for performance and rarely can you build a model that light and stay structurally sound. That’s the battle you’re going to struggle with. How light can you build your model and have it hold up to boost and ejection.

While drag is also something to reduce, do not do so if it adds weight, for example do not prime and paint your rocket to achieve a smooth mirror finish. The drag reduction will not overcome the weight of all that paint. Reduce drag by air foiling your fins, mounting them perfectly straight, and eliminating launch lugs.

However, as a beginner, your main objective should be constancy. A flier with a rocket that is not a highly competitive design, but consistently performs correctly can often beat a more bleeding edge design that doesn’t consistently perform correctly. Duration event scores are the sum of your two official flights. Disqualifying one of those flights is awfully hard to overcome.

Many 13mm and 18mm kits you may already have are great for getting started in several events like streamer and parachute durations. Some examples include the Estes Wizard, Yankee, and Viking. Aerospace Specialty Products (ASP), Fliskits, and Apogee also have a line of competition kits that are great for getting started. There are also several websites with plans for practically every contest event.

Here are some tips that can applied all events

- Use computer simulation programs to verify stability, to determine the best motor/delay, and optimum mass for events
- Build as light as possible. Weight and drag should always be on your mind as things you can control
- Work towards consistent reliable performance before you attempt design improvements.
- Strive to make a qualified flight every time before moving to advanced models and techniques
- Learn to recognize thermals
- Use magnetic tape on a pole, a digital thermometer, or both to try and identify thermals passing through the launch area.
- Learn to use a tower and a piston
- A tower eliminates the need for launch lugs which reduces drag and weight
- A piston can improve performance significantly
- In most cases go for broke on your first flight. It's harder to lose a model than you might think.
- Use a notebook to list upcoming contests, events, and weight factors. Also use it to log your competition flights for later analysis

Competition is a lot of fun. I enjoyed it for 10 years during the 80’s and 90’s. I had a great teammate and we performed well in regional meets and NARAMS. As with everything else, there can be a dark side to contest flying. Kevin Wickart's "Contest Etiquette" article does an excellent job of explaining the various types you might run into at a contest. I can absolutely state in all my time flying contests that running into a poor sportsman is the rare exception and not the rule. Unfortunately, it only takes one to ruin a good time. A good contest director is quick to identify when this is happening and stop it before it spoils the good time being had by all. Kevin's article can be found here,
https://sites.google.com/site/xnarcompetition/home/contest-etiquette

Here are a couple websites with guides, articles, and plans to help you on the road to contest flying.
https://sites.google.com/site/xnarcompetition/home
http://www.nar.org/contest-flying/competition-guide/

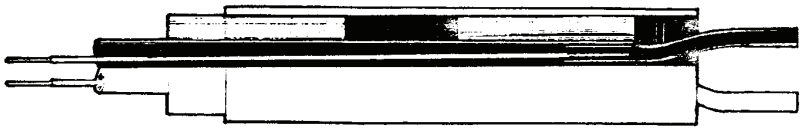
If you are looking for supplies this is a good list for find vendors,
https://sites.google.com/site/xnarcompetition/home/competition-supplies-vendors

Continued on page 13

THE BRASS HEAD PISTON LAUNCHER

Reprinted with author's permission

By George Gassaway
(SNOAR News article)



This internal/external view of the assembled brass pistonhead shows the placement of the wiring, ignition tubes, ¼" tubing, masking tape spacers, and ½" brass tubing.

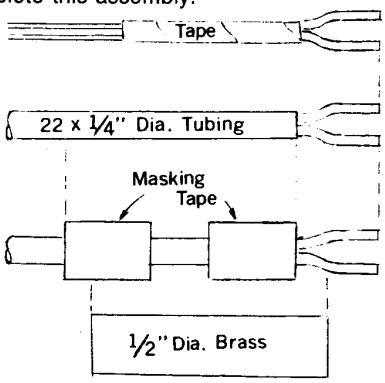
The Brass Head Piston Launcher was developed in early 1979 by the efforts of Jim Murray, Larry Peters, and myself. Jim's studies indicated that longer pistons should work better. Meanwhile, my problems with previous piston heads led to the brass head coated with cyanoacrylate (Hot Stuff, Jet, etc.). Larry Peters was the firs to combine both ideas. His second flight off this "high tech" piston accelerated enough to rip the tube when it stopped! Matt Steele used a Standard diameter (18mm) Brass Head Piston Launcher to achieve the second highest Scale Altitude flight at the 1980 World Space Modelling Championships, despite the extra drag of his model Sandhawk's antennas.

The following article/plan describes the construction and use of a mini-engine version of the Brass Head Piston Launcher with a new system for plugging in the igniter which eliminates virtually all of the frustrations of getting continuity with other zero-volume piston launchers.

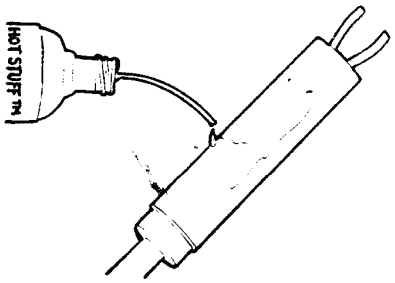
ASSEMBLY

Cut out all metal parts, sanding or filing inside or outside edges smooth where needed. Bend the 3/32" brass ignition tubes as shown so they will fit into the core tubing but still be wide enough apart at the top to prevent shorting. Strip the insulation of ½" of the ends of the thin electrical wires and solder them into the ignition tubes.

Use masking tape to insulate the ignition tubes, then wrap them together with more tape. This assembly should fit snugly into the ¼" core tubing. Use an ohmmeter to check for any electrical shorts then glue the ignition tube assembly into the core using a cyanoacrylate. Next, wrap the core tubing with tape as shown in the drawing so that the ½" diameter brass tube will be properly centered. Apply cyanoacrylate to the areas where the tape meets the ¼" core tubing so the tape will never slip. Slide the ½" brass piston head into position and apply cyanoacrylate. Fill the ¼" recess on top with epoxy to complete this assembly.

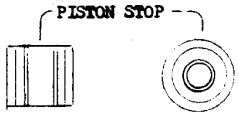


The next step is tricky. Since the ½" diameter brass piston head is a bit undersize, it must be coated with a few thin layers of cyanoacrylate to build up the diameter for a good fit in the sliding piston tube (Estes BT-5, CMR RB50, etc.). To protect your fingers during this difficult operation, I suggest you cover them with plastic or rubber gloves. Start by carefully putting a drop of cyanoacrylate on the side of the brass piston head, spread it over the surface for about one second, and then quickly remove your finger before the glue "dries" (sticking one's self to the piston head is considered bad form.) After the glue cures, apply another coating and repeat this procedure until the proper diameter is achieved. Mistakes can be corrected by sanding and additional coats of cyanoacrylate.



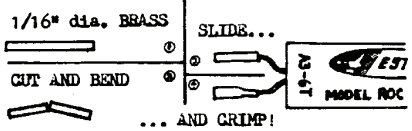
A somewhat unexpected benefit of this cyanoacrylate coated brass piston head was that the piston tube and the piston head are not damaged as much as conventional piston launcher piston heads and tubes are. This means that the piston tube requires less frequent cleaning and lasts longer.

The piston tube needs a stop at the end so that it will not go up with the model. It should also be sturdy. One can be fabricated from an expended mini-motor casing, masking tape, and 5/16" diameter tubing, as illustrated. Use Titebond or epoxy to mount it inside the end of the piston tube.

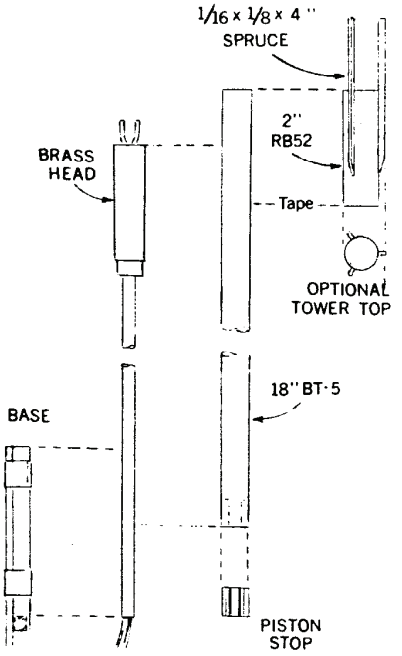


IGNITION

The ignition system may appear a bit of a hassle but it is well worth it. In just 10 or 15 minutes the night before the contes you can make enough brass-tipped igniters to fly every event off you Brass Head Piston Launcher, if desired. This small investment in time is m iniscule compared to the amount of time that could be lost checking and rechecking continuity on a conventional piston launcher.



I cut the 1/16" diameter brass tubing in ¾" lengths and sand or file the ends so they will easily fit into the 3/32" ignition tubes. Then I saw a notch in the middle and bend the 1/16" tube into a "V" and wait for the meet. At the contest, after my model is prepped and the igniter is installed in the engine, I break the 1/16" brass tube in two, slip a piece of it over each end of the igniter leads, and crimp them with pliers for a secure grip. At the pad, after wrapping the engine for a good fit in the piston tube, I simply push the brass igniter tips into the piston ignition tubes and slide the piston tube up around the motor. Then I attach the launch system clips to the lead wires of the piston, check for continuity, and it's...5...4...3...2...1....



This Month In Aerospace History

Space History

Buzz Nau

Source—NASA Archives

60 Years Ago

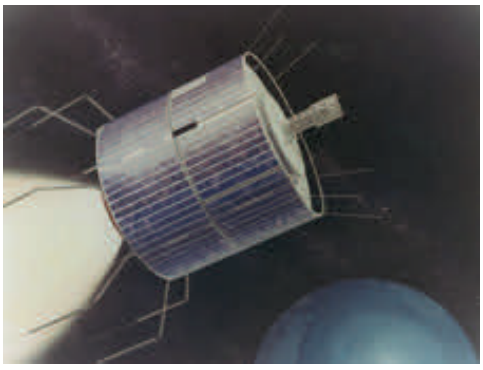
While Sputnik 1 was a mild shock to the US, Sputnik II was a much bigger one. The satellite weighed over 1,000 pounds and carried the dog Laika. Though the USA was close to launching its own satellites into orbit and arguably could have beaten the USSR, they had nothing close to being able to orbit a payload of that weight It was a major wake up call.

55 Years Ago

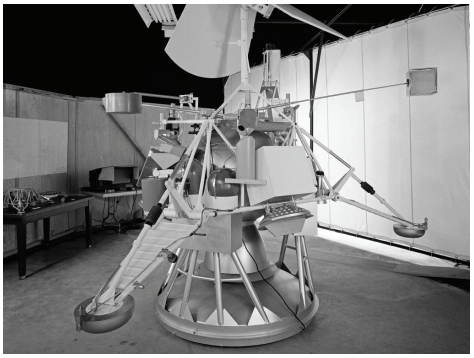
Saturn SA-3 a Saturn 1 test flight, is launched from Cape Canaveral. It carried an amazing 23,000 gallons of water on a suborbital flight to 167 km. It was the third flight of the Saturn 1.

50 Years Ago

ATS 3 launched aboard an Atlas Agena from Cape Canaveral. The ATS (Applications Technology Satellite) program objective was to test technology common across many satellite programs. Main objectives for ATS 3 included spin stabilization techniques and VHF and C-band communications experiments.



Surveyor 6 is launched on an Atlas Centaur from Cape Canaveral. Part of the mission to land and map the moon prior to manned landings. Surveyor 6 was the first spacecraft to be launched the lunar surface. After its initial landing, it lifted off 3 meters and flew 2.5 meters from its original landing point confirming the moon's surface is basaltic.



Apollo 4 is launched from Kennedy Space Center. It was the first flight of the Saturn V vehicle.

ESSA 6 is launched atop a Thor Delta from Vandenberg Air Force Base. ESSA 6 was a sun-synchronous operational meteorological satellite designed to provide real-time earth cloud cover TV pictures to properly equipped ground receiving stations for use in weather analysis and forecasting.

WRESAT 1 is launched Woomera Australia. Built by the Australian Weapons Research Establishment, it is Australia's first satellite. It was flown on a modified Redstone booster.

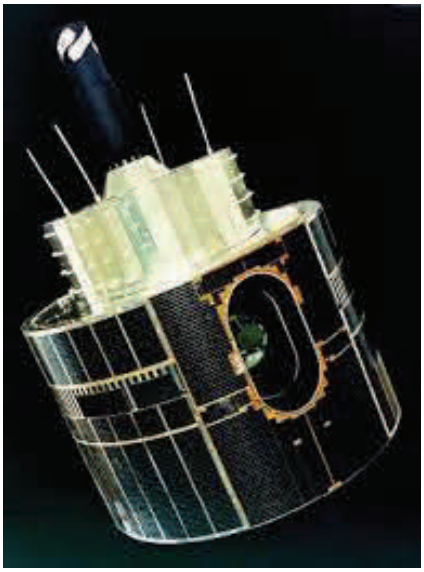
45 Years Ago

Anik 1 (TELESAT 1) is launched by a Delta vehicle from Cape Canaveral. The Eskimo word for "brother", the Anik series of satellites were launched for Canadien domestic communications.

Explorer 48 is launch atop a Scout from San Marco Facility off Kenya in the Indian Ocean. It main objective was to study gamma radiation.

40 Years Ago

Meteosat 1 launched on a Delta from Cape Canaveral. Meteosat 1 was a geostationary satellite that supplied data for the improvement of weather forecasts.



35 Years Ago

Space Shuttle Columbia (STS -5) is launched from Kennedy Space Center. Commercial Communications Satellites (ANIK C-3)/ Satellite Business Systems (SBS-C) are deployed. Mission Duration: 5 days 2 hours

25 Years Ago

Germany launched the Maxus sounding rocket from Kiruna, Sweden. Sponsored by the ESA, the Maxus performed microgravity experiments.

20 Years Ago

Space Shuttle Columbia (STS-87) is launched form Kennedy Space Center. Carried aboard USMG-4 (microgravity payload). Mission Duration: 15 days 16 hours

15 Years Ago

Space Shuttle Endeavour (STS-113) is launched from Kennedy Space Center. IIS flight 11-A. Delivered equipment and swapped crew. Mission Duration: 13 days 16 hours

NASA sets a balloon world record for largest launched balloon. The 60 million cubic foot balloon carried a 1,500-pound scientific payload.

10 Years Ago

Japan's Selene lunar orbiting spacecraft captures first high definition photos of Earth rise and Earth set.

Competition Basics Cont. from page 10

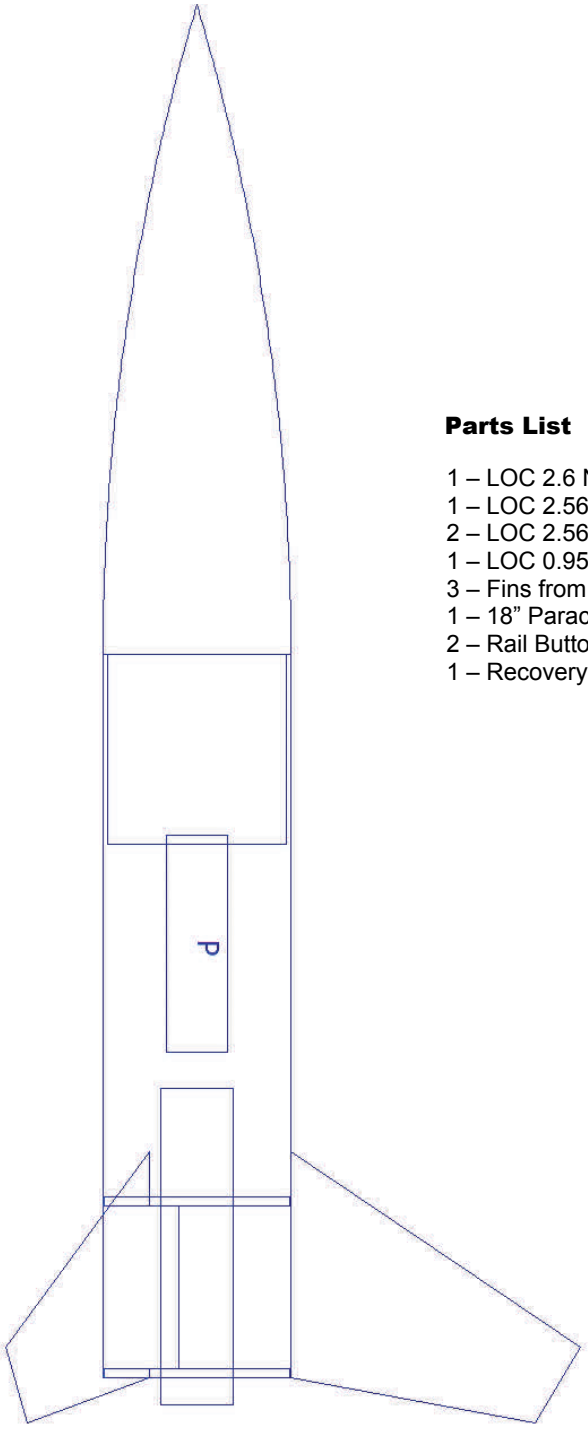
George Gassaway recently started a competition forum dedicated to spreading information on competition rocketry. It's just getting started, but already has a fair amount of good information. http://contestrockets.org/

In future articles, I will be discussing the individual NRC events we will be flying this season with specific tips, plans, and a list of existing kits that can used for those events.

I hope the idea of flying in a contest sounds like an exciting, fun and challenging way to enjoy model rocketry. Many of the assembly, design, and flying techniques you learn in competition can be carried over to help you in sport flying.

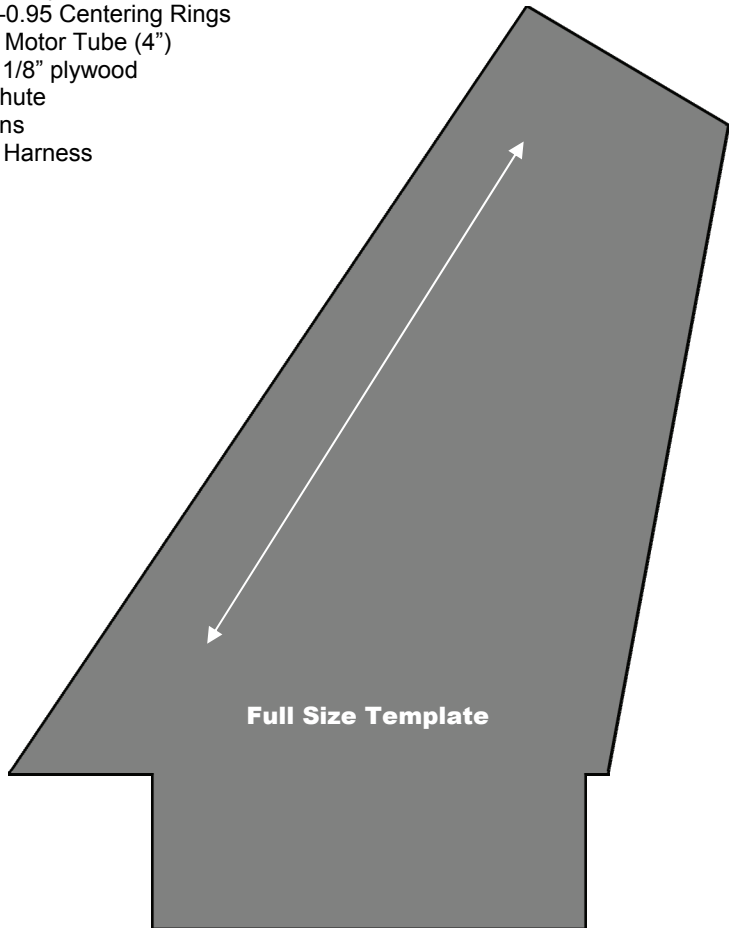
THOY Wren

Sport Plan



Parts List

1 – LOC 2.6 Nose Cone
1 – LOC 2.56 Body Tube (10”)
2 – LOC 2.56-0.95 Centering Rings
1 – LOC 0.95 Motor Tube (4”)
3 – Fins from 1/8” plywood
1 – 18” Parachute
2 – Rail Buttons
1 – Recovery Harness



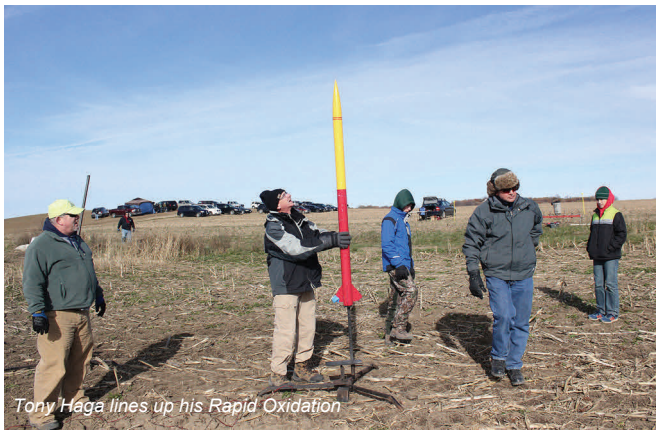
November Sport Launch

Buzz Nau & JMRC

Photos by Buzz Nau unless otherwise noted

With both launch dates cancelled in October due to bad weather, we really wanted to get in our final scheduled launch for 2017. Luckily there was sufficient time since the last rainfall for the fields to dry and firm up enough to press on with the launch. We had already committed to flying if at all possible so the Sylvania North View High School students could get in their Junior Level 1 certification attempts.

Temps in the morning began in the teens with a stiff southerly breeze. It would eventually "warm" up to just above freezing and fortunately the breeze did not increase with the temperature. Thanks to much of the BOD and hard core fliers, we set up the range at the Horning 2 field while the students pulled in and began prepping their rockets.



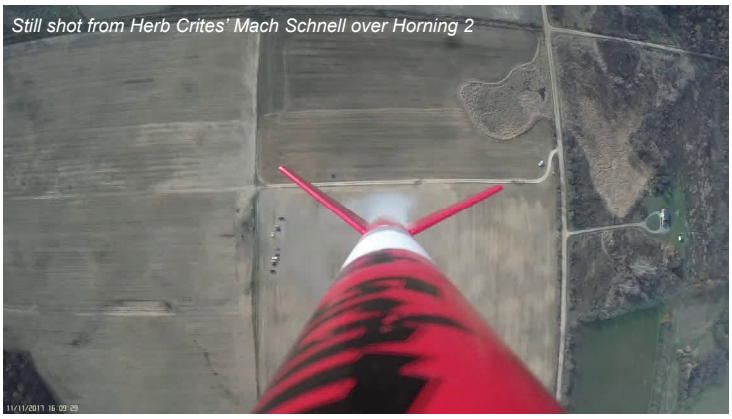
Tony Haga lines up his Rapid Oxidation

In all, 22 students attended and successfully flew to earn their junior level 1 certification. They each purchased a package deal that included the kit and an Aerotech DarkMatter H motor. The only minor issue appeared to be the rail buttons, as several came off while loading on the pads, but all were repaired and flown. This was a fantastic effort from the students and teachers, Ryan Reed (TRA L2) and John Eckhard (TRA L1). This is the third time they have brought students to a JMRC launch to certify.

Tom Kurecka's Prion

Tom Kurecka also attended and it was good to see him after a hiatus the past few months. His first flight of the day was a beautiful Thor Agena. Tom has flown this several times before and it always puts in a nice flight. This time however, the Estes D12-5 blew the nozzle about 20' off the pad in a violent cato. Fortunately there was no damage to the rocket. Next Tom, flew a very nicely done Estes Little Joe 2 on an Aerotech E30-7. Two fins came off, one at ejection and one on landing. Incredibly he was able to recover both fins! Other flights from Tom included his Sunseeker on a H118-7 classic, Firestorm powered by a H120 Red Lightning, and his Prion on a J425 Blue Streak. The Prion suffered a forward closure failure and damage to the ebay, but otherwise will fly again. Tom posted several launch videos from the day. You can find his YouTube Channel at, 4FlyRockets

Tony Haga got in one nice flight before taking on LCO duties for the day. He put up his Rapid Oxidation in a I345 White Thunder to 2,073'. Dual deployment recovery and landed safely on the field.



Still shot from Herb Crites' Mach Schnell over Horning 2

Herb Crites came with a car load of Mach Schnells (ok, maybe not that many) and put in seven flights throughout the day as well as assisting the students. Herb also shared his pad with them. Three of Herb's flights were his Mach Schnell SLK on Aerotech F39 and F35 motors. Altitudes were 800' and 950'. Three more flights were made with his SLK 54 (B build). Motors used included a Loki H-144 White, Aerotech H268 Redline and an Aerotech H669 Warp Nine. That's right….. a H669. Altitudes were between 1,435' to 1,802'. As if that weren't enough, Herb flew his SLK 54 (C build with Trackimo Tracker) on an Aerotech H999 Warp Nine to 1,996'. The chute on the flight failed to unfurl, but no damage was incurred. If you want to see a rocket flat out disappear from the pad then try a H999!

One of the student rockets lifts off on an Aerotech Darkmatter motor

Dave and Sarah Glover put in many nice flights fearless of the cold. Dave's first flight was his Double Trouble scratch build on a pair of Aerotech F42-8's. The Chute Release worked and despite the chute fouling, there was no damage. He flew several other scratch builds including his Batty and PeeWee two stagers. Both flew on A10-0/A10-4 combinations. The PeeWee sustainer was lost after no ignition. Dave also had a cato as his Quest Planet Probe blew out the clay nozzle just as it cleared the rod. The Black Panther is another scratch build of old rocket parts. It flew on an Aerotech F42-8 to 1150'. Again, the chute release "released", but the chute failed to open. Dave's final flight was an Apogee Stratus Gale rocket glider. It boosted and glided well even though it plowed into my car. ;) Dave really enjoyed the build and looks forward to flying it again.

Sarah Glover's Mega Mosquito

Sarah Glover flew her Mega Mosquito twice on Estes E12-6's. Both flights went straight with a slight rotation and were recovered without damage.

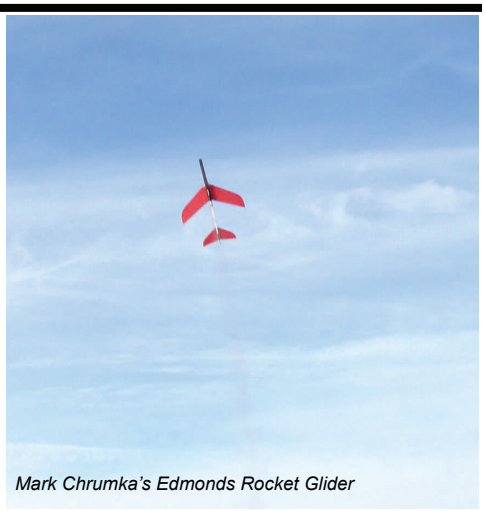
We also thank Dave for always bringing a cleaning station for use by the port-a-john. It is very much appreciated Dave.

Dan Harrison flew a couple sugar motors including one moonburner that had an amazing slow lift off and long burn. He also launched a small 3d printed saucer on a 38mm motor to great effect. Trevor Harrison and his friend, also put in several flights and helped on the range.

Tom Kurecka's Little Joe 2

Dan Harrison's sugar J motor

Mark Chrumka put in four flights. He tried an Estes Big Daddy with a Jolly Logic Chute Release, but the delay was a bit too long for the weathercock and did not get a chute deployment. No damage though. He had a similar problem with his Aerotech ISQY Tomahawk which core sampled. Again, damage was minimal due to the recent rains and soft field. His last flights were a pair of Edmonds RGs, the A/RG and RGX. Both transitioned nicely and flew nominally.


Mark Chrumka's Edmonds Rocket Glider

There were no contest flights as the cold and wind were not conducive to good times and none of the usual suspects were feeling up to it

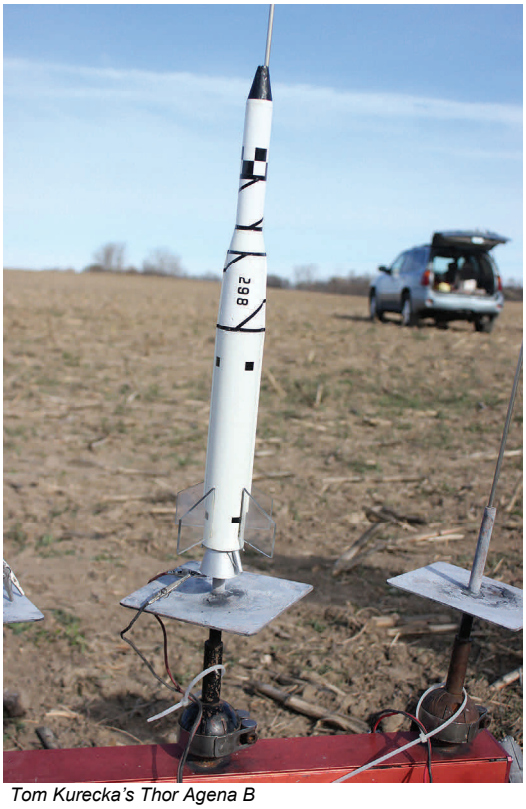
That pretty much wraps up our flying season for 2017. Don't forget our maintenance day is December 2. Please consider coming out to Roger's and lending a hand.

Link to photos of the launch, [11 November 2017 JMRC Sport Launch]

Another successful Junior Level 1 flight

November Sport Launch Photo Page

Dave Glovers Double Trouble on a pair of F42-8 motors



Tom Kurecka's Thor Agena B

Tom Kurecka's Thor Agena B D12-5 CATO

Sylvania North View HS Junior Level 1 students

New Product News

Estes

There are two new rockets on Estes' "Coming Soon" list. One appears to be a re-release of the Super Big Bertha as a Pro Series II kit. This version will include the same motor retention system found in other Pro Series II kits. List price is $39.99

Next is the Astron Explorer. A skill level 4 kit, it is a BT-55 based kit that is just over 42" tall. It has shades of the Astron Trident with side pods that will duct the ejection gases. It is 24mm powered and lists for $27.99

Aerotech

The first new kit release from Aerotech in 16 years. The Arreauxbee-Hi will be available soon from retailers with a MSRP of $99.99. It slightly resembles the Aerobee-Hi sounding rocket implied in it's name. Designed by Bob Sanford, the Arreauxbee-Hi can be flown on 24mm and 29mm motors. It is 2.6" in diameter and 54" tall. It also includes an aluminum motor retainer .

eRockets

Newly released is an adjustable 4 fin rail launch tower kit. It allows you launch a variety of diameters of 4 fin rockets without the need of a launch lug. Especially helpful for scale rockets. It can mounted to a traditional pad that accepts a 1/4" rod and lists for $39.99

Coming Soon!

Our Members in the Field...

Dale Hodgson (l) and Tony Haga (r) assist a student loading his Jr L1 rocket

Teacher, Ryan Reed (l) and Herb Crites (r) assist a student loading his Jr L1 rocket

Dave Glover (l) and Sarah Glover (r) prepping for launch